cs523 - Big Data Technology

Lab 9 – Apache Spark

Submit your *own work* on time. No credit will be given if the lab is submitted after the due date.
Follow the instructions completely.

Step 1: Verify if Java is installed

Java is a pre-requisite software for running Spark Applications.
Use the following command to verify if Java is installed on your system :-

```
[cloudera@quickstart ~]$ java -version
java version "1.8.0_211"
Java(TM) SE Runtime Environment (build 1.8.0_211-b12)
Java HotSpot(TM) 64-Bit Server VM (build 25.211-b12, mixed mode)
```

Support for Java 7 is deprecated as of Spark 2.0.0

For doing this lab, you need to upgrade your CDH to JDK8 if it's still JDK7. If you are not sure how to do this then ask me for instructions.

1. Spark Practice Lab

   No need to submit this part.

   I. Spark WordCount in Local mode
   II. Spark WordCount in Pseudo-distributed mode

2. Spark Homework Lab

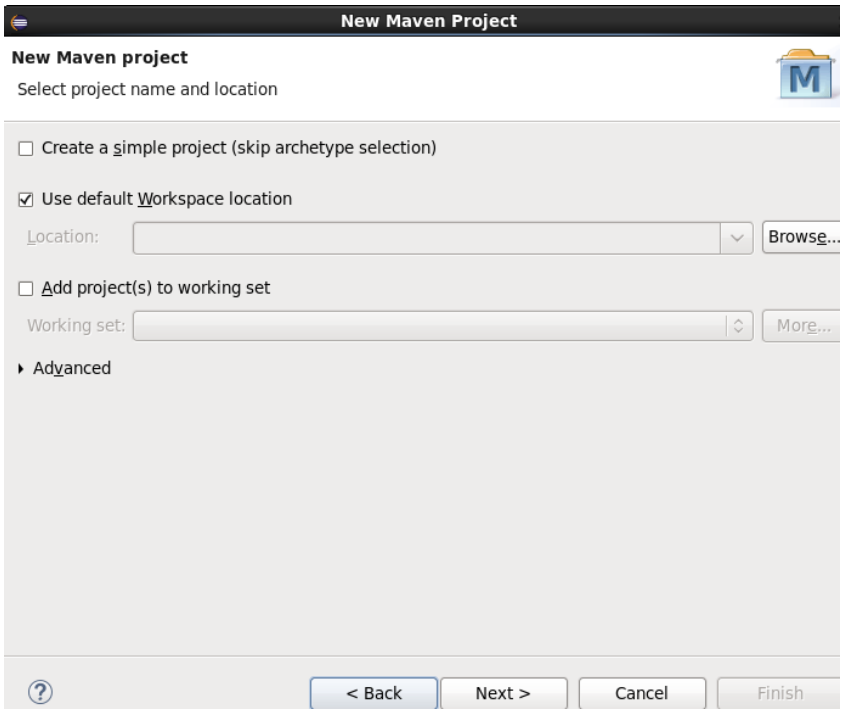
   Submit ".java" files and output along with the command that you used to run the program in pseudo-distributed mode.

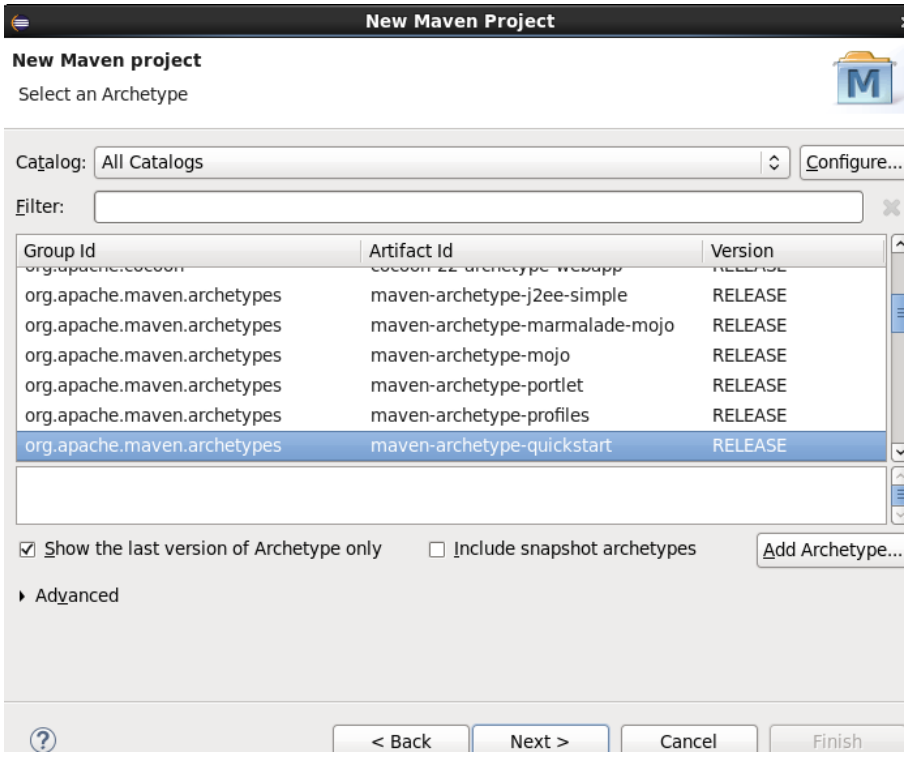
   Paste screenshots wherever applicable.

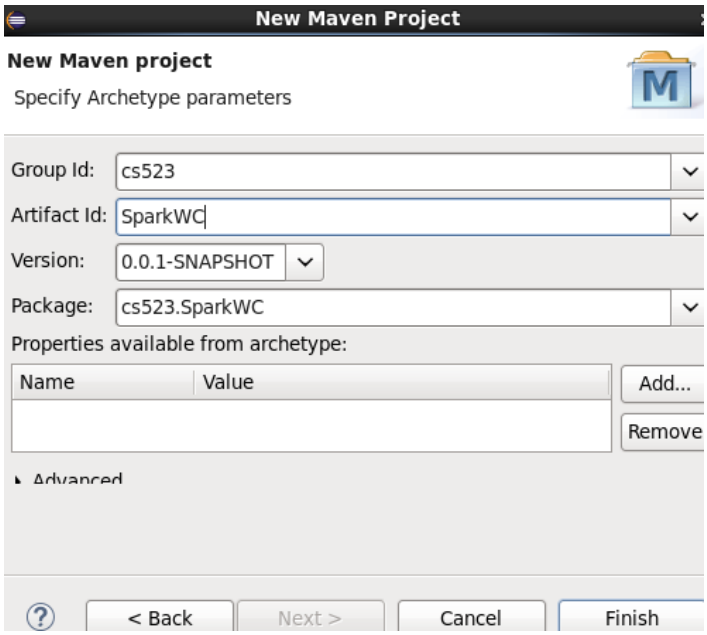
Spark Practice Labs

Part 1 - Spark Word Count in local mode

1. Need to create a Maven project in Eclipse for spark word count.







2. Spark Word Count Java programs (JDK 7 and 8) are given to you, download them and add them to your project. Create two separate Maven projects for jdk7 and jdk8 programs. (You can safely delete App.java and test packages that got created by default)
3. Your pom.xml file should look like the one which is given to you. It'll add all the required dependencies to your project.
4. Create folder "input" in your project path and add a test input file there on which you'll run the word count.
5. Run the given word count java programs as Java application.
6. You can check the part file in the output folder after refreshing the project.

Part 2 - Spark Word Count in pseudo-distributed mode

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1. Make sure your input folder is present under "/user/cloudera" directory and it has the input file in it.
2. Create jar of your project using *mvn package* command or from eclipse, right click on *pom* file then *Run As* and then doing *maven build..* and keep the *goals* as *package*. The created jar file will be inside the *target* directory. I'm saving the jar file to Desktop but you can choose any other path.
3. Now you need to submit this jar to the Spark cluster which is running on YARN using the following command.
   spark-submit --class "cs523.SparkWCjdk8.SparkWordCountjdk8" --master yarn Desktop/SparkWCjdk8.jar /user/cloudera/input/ /user/cloudera/output
4. After successful execution, it'll create an output folder in "/user/cloudera". Check it and verify the part file.

Spark Homework Lab

Complete this HW using Java 8. Provide the java programs and screenshots (wherever applicable).

1. This question is an enhanced version of WordCount. In this version of WordCount, the goal is to learn the distribution of letters in the most popular words in a corpus; meaning now we need to calculate **character (letter) count *of the most popular words***.

Your application must do the following:

a) Get a word frequency *threshold* from user. You can supply this number as runtime arguments to your program. For example, my *threshold* is 30.

b) Read an input set of text documents.

c) Count the number of times each word appears in those documents.

d) Filter out all words that appear fewer times than the *threshold*. So now the remaining words will be your most popular words.
For example : Java 50
MapReduce 65

e) For these remaining words, count the number of times each letter occurs. While calculating this letter count, take into account the number of times those words have occurred.
For example: a 165
d 65
e 130
j 50
and so on…..

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2. In this question, you'll start the Spark shell (spark-shell) and use it to write a Spark program in Scala.
In spark shell, you can use *CTRL-L* to clear the screen and *exit* for coming out of the shell.

Problem Statement: Spark uses some third-party libraries. **You need to find out how many of these are licensed under the BSD license** (acronym for Berkeley Software Distribution).

Luckily, Spark comes with a file named LICENSE, located in the Spark root directory (**`/usr/lib/spark/LICENSE`**). The LICENSE file contains the list of all libraries used by Spark and the licenses they're provided under. Lines in the file, which names packages licensed under the BSD license, contain the word BSD. You could easily use a Linux shell command to count those lines, but that's not the point.

Write the Spark shell commands to count the lines using the Scala Spark API.